

Green Tea Extract and Antioxidant Status

GENERAL INFORMATION:

- **Active component[s]:** Caffeine, d-catechin, epicatechin, epicatechin gallate and epigallocatechin gallate [EGCG] (Min and Peigen, 1991).
- **Source material:** Leaf.
- **Dosage route:** Oral.
- **Directions of use:** Take with food.
- **Duration of use:** Consult a health care practitioner for use beyond 12 weeks.
- **Target Population:** Individuals actively maintaining good health.
- **Risk Information:**
 - Consult a health care practitioner prior to use if you have a liver disorder or develop symptoms of liver trouble [such as abdominal pain, dark urine or jaundice], or if you are pregnant or breastfeeding, or if you have an iron deficiency (NHPD, 2008).



HUMAN HEALTH INDICATIONS:

Recommended Use or Purpose	Dosage Range
<p>General</p> <p>Source of antioxidants for the maintenance of good health.</p> <p>*Take with food (NHPD, 2008)</p>	<p>Of extracts up to 690 mg total catechins, and no more than 150 mg caffeine, per day.</p>

GREEN TEA EXTRACT AND ANTIOXIDANT STATUS

Green tea is known for its high polyphenol content containing flavanols such as catechins and epicatechins that are believed to have potent antioxidant ability *in vivo* (Ferruzzi, 2010). According to the monograph provided by the Natural Health Product Directorate of Health Canada, 690 mg total catechins, and no more than 150 mg caffeine, per day provides a source of antioxidants for the maintenance of good health (NHPD, 2008).

A clinical study measuring the effect of green tea catechins on oxidated LDL levels administered 690 mg green tea catechins and approximately 70 mg caffeine taken daily in oolong tea for 12 weeks. After a two week run-in period, 35 healthy men were randomized to one of two groups: oolong tea + catechins or oolong tea only. After the treatment with green tea catechins, malondialdehyde-modified LDL - a measure of LDL oxidation and an indirect indicator of antioxidant status, was significantly reduced (Nagao et al., 2005).

In another clinical study looking at the effects of green tea in oxidative stress, 34 individuals consumed 1 L of green tea daily for 4 weeks. The study was randomized and the control was plain water. After 4 weeks of tea drinking, there were significant reductions in serum levels of malondialdehyde and oxidative stress within erythrocytes. There was also a rise in antioxidant capacity observed (Coimbra et al., 2006).

A study investigating the pharmacokinetic effects of consuming green tea catechins as a supplement compared to tea form found both to have favorable effects on antioxidant status. Three [3] bags of green tea or 3 green tea extract supplements matched for epigallocatechin-3-gallate content [EGCG - a potent catechin antioxidant] were used as treatment. Healthy subjects [n=30] were randomly assigned to a treatment group in a crossover designed trial with a 1-week washout period in between. The dose of catechins was administered in a bolus and plasma antioxidant capacity was measured for the 8 hours that followed. While both forms increased plasma antioxidant capacity, the catechins from the green tea supplement resulted in a small but significantly greater effect than the catechins from tea (Henning et al., 2004).

Another study administered 375 mg of catechols [270 mg as EGCG] for 5 weeks to 14 healthy women. While the main outcomes of this study were cardiovascular, the consumption of the green tea extract was associated with a significant 37.4% reduction in the concentration of oxidized LDL [p=0.017], representing a decrease in serum oxidizability (Tinahones et al., 2008). Overall, these findings support the claim recognized by the NHPD that green tea polyphenols taken between 120-690mg along with caffeine at less than 150mg per day has an anti-oxidant effect.

SAFETY AND TOXICITY:

A study examining the safety of EGCG and Polyphenon E [green tea extract] in healthy individuals showed that 800 mg/day or 400 mg consumed twice a day had no serious adverse effects after a 4 week intervention period. Some minor side effects included excess gas, upset stomach, nausea, heartburn, stomach ache, abdominal pain, dizziness, headache, and muscle pain. However, most of these symptoms were also seen in the placebo group (Chow et al., 2003).

In a study conducted by Nagao and colleagues, 690 mg of total catechins taken daily for 12 weeks in the form of an oolong tea beverage had no serious adverse effects in any of the subjects enrolled (Nagao et al., 2005). Moreover, 700 mg/day total flavanols from green tea in beverage form versus 460 mg/day total flavanols in green tea extract supplements resulted in no side-effects or serious adverse reactions when taken over the course of a 3 week study (Henning et al., 2004).

CAUTIONS, WARNINGS, CONTRAINDICATIONS AND INTERACTIONS

Green tea and green tea extract may contain caffeine therefore; caution is warranted to individuals taking stimulant drugs (WebMD, 2010).

Consult a health care practitioner prior to use if you have a pre-existing medical condition, are taking prescription medications, or are pregnant or breastfeeding.

For additional information from the clinical literature regarding interactions, please refer to the following tables:

DRUG	INTERACTION WITH GREEN TEA EXTRACT
Warfarin	A case study by Taylor et al., demonstrated that one-half to one gallon of green tea consumed per day decreased international normalized ratio of warfarin (Taylor et al., 1999).

NATURAL HEALTH PRODUCTS [NHP] SUBSTANCES	INTERACTION WITH GREEN TEA EXTRACT
Iron	In patients with thalassemia major and intermedia, tea consumption caused a 41-95% inhibition of iron absorption (de Alarcon et al., 1979).

FOOD	INTERACTION WITH GREEN TEA EXTRACT
Dairy	Serafini et al demonstrated that 100 mL of whole milk may mask the antioxidant capacity of 300 mL of green tea <i>in vivo</i> (Serafini et al., 1996). However, a more recent study examining 2 grams of tea solids in 300 mL of water with or without milk had no effect on antioxidant activity <i>in vivo</i> (Leenen et al., 2000).

YOU MIGHT ALSO BE INTERESTED IN OUR REPORTS ON:

- ✓ Carotenoids and antioxidant status
- ✓ Cinnamon and antioxidant status
- ✓ Selenium and antioxidant status
- ✓ Vitamin E and antioxidant status

REFERENCES

- Camargo, A.E., Daguer, D.A., and Barbosa, D.S. 2006. Green tea exerts antioxidant action in vitro and its consumption increases total serum antioxidant potential in normal and dyslipidemic subjects. *Nutrition Research*; 26: 626-631.
- Chow, H.H.S., Cai, Y., Hakim, I.A., Crowell, J.A., Shahi, F., Brooks, C.A., Dorr, R.T., Hara, Y., and Alberts, D.S. 2003. Pharmacokinetics and safety of green tea polyphenols after multiple-dose administration of epigallocatechin gallate and polyphenon E in healthy individuals. *Clinical Cancer Research*; 9: 3312-3319.
- Coimbra, S., Castro, E., Rocha-Pereira, P., Rebelo, I., Rocha, S., 2006. Santos-Silva, A. 2006. The effect of green tea in oxidative stress. *Clinical Nutrition*; 25(5): 790-796.
- de Alarcon, P.A., Donovan, M.E., Forbes, G.B., Landaw, S.A., and Stockman, J.A. 1979. Iron absorption in the thalassemia syndromes and its inhibition by tea. *New England Journal of Medicine*. 300(1): 5-8.
- Ferruzzi, M.G. 2010. The influence of beverage composition on delivery of phenolic compounds from coffee and tea. *Physiology and Behavior*; 100(1): 33-41.
- Henning, S.M., Niu, Y., Lee, N.H., Thames, G.D., Minutti, R.R., Wang, H., Go, V.L. and Heber, D. 2004. Bioavailability and antioxidant activity of tea flavanols after consumption of green tea, black tea, or a green tea extract supplement. *American Journal of Clinical Nutrition*; 80(6): 1558-1564.
- Leenen, R., Roodenburg, A.J., Tijburg, L.B., and Wiseman, S.A. 2000. A single dose of tea with or without milk increases plasma antioxidant activity in humans. *European Journal of Clinical Nutrition*; 54(1): 87-92.
- Min, Z. And Peigen, X. 1991. Quantitative analysis of the active constituents in green tea. *Phytotherapy Research*; 5: 239-240.
- Nagao, T., Komine, Y., Soga, S., Meguro, S., Hase, T., Tanaka, Y., and Tokimitsu, I. 2005. Ingestion of a tea rich in catechins leads to a reduction in body fat and malondialdehyde-modified LDL in men. *American Journal of Clinical Nutrition*; 81(1): 122-129.
- NHPD. 2008. Green tea extracts. Accessed on: October 13, 2010. Available at: http://www.hc-sc.gc.ca/dhp-mps/prodnatur/applications/licen-prod/monograph/mono_greentea-thevert-eng.php
- Serafini, M., Ghiselli, A., and Ferro-Luzzi, A. 1996. In vivo antioxidant effect of green and black tea in man. *European Journal of Clinical Nutrition*; 50(1): 28-32.
- Taylor, J.R. and Wilt, V.M. 1999. Probable antagonism of warfarin by green tea. *The Annals of Pharmacotherapy*; 33(4): 426-428.
- Tinahones, F.J., Rubio, M.A., Garrido-Sánchez, L., Ruiz, C., Gordillo, E., Cabrerizo, L., and Cardona, F. 2008. Green tea reduces LDL oxidability and improves vascular function. *Journal of American College of Nutrition*; 27(2): 209-213.
- WebMD. 2010. Green Tea. Accessed on: October 13, 2010. Available at: <http://www.webmd.com/vitamins-supplements/ingredientmono-960-GREEN+TEA.aspx?activeIngredientId=960&activeIngredientName=GREEN+TEA&source=3>